DOCUMENT RESUME

ED 315 008 HE 023 174

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TITLE Varsity Sport Participation and Consumption as Two of Several Factors Associated with College Achievement and Attrition.
PUB DATE 20 Oct 89
NOTE 43p.; Paper presented at the Annual Meeting of the Midwestern Educational Research Association (Chicago, IL, October 20, 1989).
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Academic Achievement; College Athletics; Extramural Athletics; *Grade Point Average; Higher Education; Longitudinal Studies; Research Methodology; *Social Integration; State Universities; Statistical Analysis; *Student Attrition; *Student Characteristics; *Student College Relationship; Student Motivation
IDENTIFIERS Ball State University IN

ABSTRACT

The study reported in this paper used path analysis statistical methodology and an attrition model to examine the separate and combined relationships of several different types of background, personal, and college experience variables with the attained college grade-point average (GPA) and graduation rate for 3,125 Ball State (Indiana) University (BSU) students. Data were collected during a 6-year longitudinal study of 1983 BSU freshmen. Key concepts examined included: (1) degree of differences in background, personality attributes, academic preparation, and commitments that students have when they enroll in college; (2) degree to which students become integrated into the institution's academic system; and (3) the degree to which students become integrated into the institution's social system. Findings indicated the cumulative effects of these variables on college achievement and attrition were substantial though there still remained a large percentage of unexplained variance in the attained GPA and graduation status variables. Sample findings supporting the importance of social integration indicated that GPA means and graduation rates were higher for both athletes and spectators than for other students. Tables providing detailed study data and analyses are attached. 32 references. (DB)

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1989 Mid-Western Educational Research Meeting Paper
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Student attrition is an ongoing problem for American colleges and universities. One estimate is that about 50% of students enrolling in 4-year institutions will not graduate from the institution in which they first enroll and 30% will not graduate from any university (Kramer, Moss, Taylor, & Hendrix, 1985). A number of studies have examined relationships between attrition and a variety of variables in attempts to identify factors influencing attrition, especially variables that could be used prior to admission or soon after admission to identify particular students who will experience academic difficulty and/or leave college before graduating--so called "high-risk" students. Other than the traditional predictors of academic success (high school records and college aptitude tests), efforts to identify one or a few variables that effectively identify such "high-risk" students have had minimal success, a fact that is disconcerting to university personnel.

Several conceptual models depicting variables that influence college success and attrition have been proposed. The models essentially describe a large variety of variables and present a complex set of relationships of those variables with attrition (e.g., Bean & Metzner, 1985; Pantages &

HE 023 174

Creedon, 1978; Spady, 1970; Tinto, 1975). Relationships of attrition with variables other than traditional predictors of academic success explain why the traditional predictors are not more accurate in identifying students who will eventually graduate from college.

The present study used path analysis statistical methodology and Tinto's (1975) attrition model to examine at a conceptual level the separate and combined relationships of several different types of background, personal, and college experience variables with the attained college grade-point average (GPA) and graduation rate for 3,125 Ball State University (BSU) students. The study focuses on the magnitude of the relationships measured by partial effect size values (Cohen, 1988). The data were collected during a 6-year longitudinal study of 1983 BSU freshmen. The majority of attrition studies have used a cross-sectional design or a 1-year time period for defining attrition (see, for example, Bean & Metzner, 1985, pp. 509-519). Research procedures recommended by Pantages and Creedon for studying attrition include a longitudinal design, a time period of longer than four years, and path analysis statistical methodology. Relationships reported herein have been cross-validated using data for other BSU freshmen when such data have been available (usually a smaller sample). Some findings for specific variables used in this study as indicators of Tinto's (1975) concepts might not be relevant at other institutions, but general relationships for the concepts may be present.

Three key concepts in Tinto's (1975) attrition model are: (a) the degree of differences in background, personality attributes, academic preparation, and commitments that students have when they enroll in college, (b) the degree to which students become integrated into an institution's academic system, and (c) the degree to which students become integrated into an institution's social system. Academic integration includes GPA and other aspects related to the academic environment such as student satisfaction with the environment. Social integration includes involvement with peer groups, institutional formal and semi-formal extracurricular activities, and interactions with faculty and administrative personnel. Tinto proposed that if integration is positive, commitment and motivation to persist are enhanced; whereas, if integration is negative, commitment and motivation are reduced. Moreover, either academic or social integration may offset the other for determining persistence.

Variables used in this study as indicators of Tinto's (1975) background, academic integration, and social integration concepts were, respectively: (a) first, general characteristics comprised of academic preparation (GPA predicted from high school records and Scholastic Aptitude Test scores), location of hometown, type of high school attended, race, and sex, and second, personality attributes indicated by self-ratings in 14 skill areas, 8 types of academic concerns, and certain Myers-Briggs Type Inventory (MBTI; Myers & McCaulley, 1985) preferences; (b) the last recorded attained GPA and academic major and a composite index

of the relative difficulty of general studies courses taken during the first two terms; and (c) residence hall or non-residence hall living, participation or non-participation in college varsity sports, and attendance or non-attendance of a sample of BSU basketball games. Living or not living in a residence hall (Terenzini & Pascarella, 1984) and attending or not attending sporting events (Schurr, Ruble, & Ellen, 1986; Schurr, Wittig, Ruble, & Ellen, 1988) have been identified with social factors.

Reviews of retention research indicate that studies investigating relationships among high school achievement, measures of scholastic aptitude, college grades, and retention have consistently reported positive relationships among these variables (e.g., Bean & Metzner, 1985; Pantages & Creedon, 1978; Tinto, 1975). In addition, for residential institutions, students living in residence halls tend to persist longer than students living in other types of housing. However, results for relationships of college grades and retention with other variables such as type of high school attended, hometown, sex, race, and personality of students have been inconsistent.

One tenable explanation for inconsistent findings among attrition studies is the difference in research procedures used in the studies (Bean & Metzner, 1985; Pantages & Creedon, 1978; Tinto, 1975); for example, differences exist for when data were collected, methods of data analysis used (e.g., two-variable versus multivariate analyses), the number of terms or years used for defining attrition, and, generally,

operational definitions of variables used in the studies (e.g., standardized personality inventories and researcher-developed questionnaires). A second explanation is the diversity in types of institutions used in the studies (e.g., 2-year, 4-year, predominantly residential or commuter, private, and public); that is, different relationships might be observed in different types of institutions. Bean and Metzner clearly identified different types of institutions in presenting their review of attrition studies, and they proposed an attrition model designed specifically for "non-traditional" students--older, part-time students enrolled in a predominantly commuter college.

There was a special interest in relationships of attained GPA and graduation status with involvement in sport as a varsity athlete or spectator and with the academic major of students. Certain aspects of theory and research relative to sport spectators suggested that students involved in at least one sport might be more persistent than other students in seeking a degree. In addition, there was the question of whether or not participation of the 1983 freshmen in the BSU athletic program was disproportionate for graduates and dropouts. The athletic program requires substantial financial resources, much of which is provided through student fees. Interest in the academic major variable concerned the "fit" of the academic preparation of students with their selected majors.

Two factors suggested that students involved in a sport would be more likely to graduate than other students: (a) the findings from research about students who attend college sporting events and (b) the particular characteristics of BSU and its students. There is evidence of personality differences between student spectators and other students (e.g., Schurr, et al., 1986; Schurr, et al., 1988), which have been liberally interpreted to support Edwards' (1973) notion that fans value "...hard work, discipline...honest competition...and so forth" (p. 245). However, more directly, the findings suggest that student spectators are more socially integrated into the college environment than other students.

Several researchers (Doyle, Lewis, & Malmisur, 1980; Lowe & Harrold, 1972; McPherson, 1975; Schurr, et al., 1986; Schurr, et al., 1988) reported attendance at college sporting events was higher for students living in residence halls than for other students. While nearness of residence halls to an arena is one explanation for the greater attendance of residence hall students, Schurr and colleagues proposed the greater attendance of these students might also have been a result of the social encouragement that residence hall students received for attending games. In part, they based this explanation on the observation that approximately 95% of students attending basketball games assured themselves of sitting beside a friend by using a reserved seating procedure, irrespective of their local residence. In addition, Schurr reported attendance of basketball games to be higher for students from hometowns more distant from the university than

for students from nearer hometowns. The interpretation given for the hometown variable was that students from hometowns more distant from the university reduced their involvement and identification with their hometown social system and became more involved with and identified more closely with the university and its social system than did those students whose hometowns were closer.

The particularly relevant institutional characteristics of BSU and its students are that BSU is a publicly supported, predominantly 4-year, residential university and over 90% (95% at the time of this study) of its students are graduates from Indiana public high schools. High schools in Indiana typically have a very strong basketball tradition. In short, many BSU students have dispositions and are from backgrounds that might lead them to view attending basketball games as a method of sensing, attaining, or expressing integration into the university social system. In addition, the fact that varsity athletes have an ongoing relationship with coaches and other players also suggests a high level of social integration for athletes.

Several studies have reported differences in the academic preparation and attrition of students enrolled in different majors, and some researchers imply that certain students academically unsuccessful in one academic field might be successful in another field (e.g., Newlon & Gaither, 1980; Schurr & Ruble, 1986; Schurr, Ruble, & Henriksen, in press; Starr, Betz, & Menne, 1972; Spady, 1970). Tinto (1975, 1982) considered differences in student body characteristics, both

among and within institutions in developing his model. In clarifying his model, Tinto (1982) stated that the model was developed to (a) explain only some facets of dropout behavior, especially differences within particular academic institutions between dropouts as either academic failures or voluntary withdrawals, and (b) highlight the potential importance of the interface between individual student characteristics and "...the collective attributes and orientations of the academic and social systems of the institution..." (p. 688). In explaining the interface, Tinto (1975) proposed that a student's likelihood of attaining satisfactory grades was relative to the academic preparation of other enrolled students--a peer group, which, in turn, affects the student's educational expectations, aspirations, and attrition.

Method

Institution

BSU has typical enrollments of about 16,000 undergraduate and 2,500 graduate students; for the present sample, 3% were black and 56% were female. The university is a NCAA Division I member and has an athletic conference affiliation with the Mid-American Conference. Students typically choose applied fields of study as opposed to fields within the sciences and humanities.

Demographic Variables and Academic Preparation

Hometown. Two categories were used to define the hometown variable: (a) being from the same county in which the university is located, an adjacent county, or a county with

one intervening county, and (b) being from some other area.

High School Type. Fourteen groupings were used to identify the type of high school from which students graduated. Twelve groupings were comprised of Indiana high schools and were based on three characteristics used by the College Board (provided on tapes sent to participating institutions) to identify high schools: community type (e.g., rural, suburban, or size of city), percentage of graduates attending college, and type of support (e.g., public or private). The other two groupings were out-of-state high schools and unclassified Indiana high schools. The 12 groupings and students identified with the groups were used in a prior study (Schurr, Henriksen, & Ruble, in press) that included a cross-validation sample. Specific characteristics of schools in each group are described in that study. Results of the prior study indicated that the improvement in predicting college grades through incorporating the high school type variable was notable for students from 4 of the groups, or about 11% of the two samples.

Academic Preparation. The index used to indicate the academic preparation of students was based on data BSU uses to admit students. These data were high school percentile rank (HSPER) and Scholastic Aptitude Test (SAT) scores. The index consisted of predicted second term GPA values computed from the student admission data.

Personality

Self-ratings of skills. The self-ratings were responses to single-item questions (each with 5 alternatives) in which

students compared their skills to skills of other students in 14 areas: the academic areas of mathematics, writing ability, creative writing, and science; and the other areas of acting, music, athletics, sales, speaking, organizing work, getting along with others, leadership, art, and mechanical. These data were obtained from responses to the College Board's Student Descriptive Questionnaire (SDQ; College Board, 1982).

Academic concerns. Academic concerns were assessed from responses to the Study Behavior Inventory (SBI; Ihle & Nisbet, 1982). The SBI consists of 75 items and yields 8 scores regarding concerns about tests, time management, note taking, academic skills, concentration, study effort, motivation, and college. Responses to the SBI were obtained during the 1983 freshman orientation program.

Myers-Briggs Type Inventory. The MBTI (Myers & McCaulley, 1985) consists of 126 items and yields four dichotomous scores indicating preferences for different types of activities: (E-I) extraversion-introversion, social as opposed to solitary settings are preferred; (S-N) sensing-intuition, immediate realities as opposed to future, hypothetical possibilities guide perceptions about alternatives; (T-F) thinking-feeling, impersonal logic as opposed to personal subjectivity influences judgments; and (J-P) judging-perceiving, plans, adherence and decisiveness as opposed to openness, flexibility and tentativeness are preferred in activities. The MBTI data were collected during the 1983 summer freshman orientation program. Typically, classroom achievement of sensing and judging types is higher than predicted from standardized tests (they score lower on

such tests than do intuitive and perceiving types) and introverts perform well in the classroom and on the tests (e.g., Kalsbeek, 1989; Myers & McCaulley, 1985; Schurr, Henriksen, & Ruble, 1988; Schurr, Henriksen, Ruble, & Alcorn, 1989; Schurr & Ruble, 1986). There is also evidence of relationships between MBTI characteristics and college retention (Kalsbeek, 1989; Schurr, Henriksen, & Ruble, in press; Schurr & Ruble, 1986; Wittig, Schurr, & Ruble, 1987). The T-F scale was not used because of its relatively high correlation with gender.

Academic Variables

Departments. Twenty-two groupings of departments were used to identify the academic major of students. The last recorded major (end of 1989 spring semester) was used for this purpose. The groupings were based on those appearing on the College Board's SDQ (1987). Most of these groupings are identified in the note accompanying Table 4.

Early schedule difficulty. The composite index used for assessing the relative difficulty of courses taken by students during their first two terms was the difference between the number of "easy" and "difficult" general studies classes in which students were enrolled during the terms. The index was based on 548 sections of 55 courses. These classes probably comprised about one-half of the classes in which students were enrolled during the two terms, thus providing only partial information about the difficulty level of an overall schedule. The classes were identified as "easy" (18%) or "difficult" (18%) if a class average grade was statistically significantly

different than the average predicted GPA of students enrolled in a class. Prior research reported this index to be associated with early GPA (Schurr, Ellen, & Ruble, 1987; Henriksen, Schurr, & Ruble, 1988) and attrition (Schurr, et al., 1987).

Social Variables

Sport involvement. Two basketball games were used to sample and identify student attendance at university basketball games. One game was played during the 1983-84 season and the second game was played during the 1984-85 season: 562 students, excluding varsity athletes, attended one of these games. Game attendance was determined by recording student identification numbers as students obtained reserved seating tickets during 3-day periods preceding the games and days of the games. Varsity athletes were identified from varsity athletic rosters (n=88). Other students comprised a third group (n=2,475).

Local residence. Local residence of students during times when games were played was used to identify students as living in a residence hall or elsewhere.

As can be noted in the foregoing description of variables used in this study, a large number of interesting relationships among variables other than those involving attained GPA and graduation status could (and did) result from various analyses. However, considering this study's focus on Tinto's (1975) model, the analyses and results described in the following pertain only to those involving attained GPA and

graduation status.

Analyses

Relationships of graduation status and attained GPA with all variables were evaluated by interpreting partial effect size values (ES; Cohen, 1988) obtained from two sets of multiple regression analyses by using the SPSSX MANOVA program (SPSSX, 1988). The analyses were conducted in a sequence that reflected "indirect" and "direct" effects (relationships) reported in attrition studies using path analysis statistical methodology.

The criterion variable for the first set of analyses was attained GPA. Graduation status was the criterion variable for the second set of analyses. In the second set of analyses, the predictor variables (including attained GPA) were nested within a student group that had achieved the GPA required by the university to avoid academic disqualification (2.00 on a 4-point scale). Two variables were used to represent attained GPA: whether or not a 2.00 GPA was achieved and, for those achieving a 2.00, the actual GPA. Three student groups were excluded from analyses of graduation status: (a) students enrolled during the 1989 spring semester who had not graduated, (b) students without a declared major, and (c) students identifying with a "general" business major. The latter two groups were excluded from these analyses so that an artificial inflation of the effect size for department major would be avoided. The "general" business major served undecided business majors, 2-year majors, and teaching majors,

and the latter two groups were identified with other groupings of majors. The MBTI, self-rating and study skills scores were analyzed as sets; that is, separate statistical tests and effect size values were not obtained for individual items and subtests.

In path analysis terminology, the partial ES values yielded by analyses of attained GPA were "indirect" effects; they affected attained GPA, which, in turn, affected graduation. Partial ES values resulting from analyses of graduation status (and included attained GPA as a predictor variable) were "direct" effects; they had effects on (or relationships with) graduation status that were independent of all other variables.

The partial ES values resulting from the analyses were correlations between residual values of a predictor variable or set of predictor variables and a criterion variable, controlling or "accounting for" relationships of other variables (Cohen, 1988): a partial r for one continuous predictor variable and a partial R (multiple correlation coefficient) for categorical variables (partial Eta values) and combinations of variables. Cohen provides qualitative terms for the magnitude of partial ES values obtained from multiple regression analyses: in the range around .14, small; .36, moderate; and .51, large. Cohen remarks, however, that the magnitude of an effect size is relative to what is known in a discipline.

Results and Discussion

Partial Effect Size Values

Partial ES values and results of significance tests for relationships of individual and combinations of variables with attained GPA and graduation rate are shown in Table 1.

Insert Table 1 about here

GPA

The ES values obtained from the analysis of attained GPA were equivalent for the predicted GPA variable (ES=.45) and combined effects of other variables used in the study (ES=.47). These values indicated that the other variables combined explained the same amount of independent GPA variance as the index of academic preparation for college. For the other variables, the combined sets of personality variables had the highest ES value (ES=.30), with the ES of each set being in the range of Cohen's (1988) "small effect." The individual variable having the highest partial relationship was academic major (ES=.23). Clearly, high school type was the most important background variable for explaining attained GPA (ES=.18). The ES for local residence (ES=.14) was in the range of a "small effect." Variables having statistically significant but lower partial relationships with attained GPA indicated the means were: (a) different for athletes,

spectators, and other students; (b) lower for blacks than for other students; and (c) lower for students with higher levels of early schedule difficulty (general studies classes) than for students with less difficult schedules.

Graduation Rate

The ES value for attained GPA obtained in the analysis of graduation status (ES=.36) was somewhat higher than the ES for other variables combined (ES=.32), with both values being in the range of Cohen's (1988) "moderate" ES criterion. In contrast to results obtained for attained GPA, the personality variables had the smallest combined ES value. Academic major had the highest ES value for an individual variable (ES=.19); high school type was the most important background variable (ES=.16); and the local residence and sport involvement variables had ES values in the range of a "small effect." Other results were that for students meeting the 2.00 GPA requirement: (a) the graduation rate was higher for males than for females, and (b) especially for students with lower attained GPA values (e.g., 2.00 to 2.90), the graduation rate was higher for students with lower predicted GPA values than for students with higher predicted GPA values.

Generally, the partial ES values obtained for the background, academic major, and social variables indicated similar "indirect" and "direct" effects of these variables on attrition; respectively, effects of the variables on attrition resulting from their relationships with attained GPA and effects on attrition after controlling for attained GPA and

other variables. By comparison, the principal effect of the personality variables was clearly "indirect."

Descriptive Data

The GPA mean was 2.48 (SD=.72) for all students. Seventy-six percent of the students attained a sufficiently high GPA to avoid academic disqualification (GPA > 1.99). Overall, 51% of the students had graduated, and disregarding a few students still enrolled, 70% of students meeting the 2.00 GPA requirement had graduated. The median GPA of graduates was 2.89. Overall, 30% of the students attained a GPA > 2.89. The difference in graduation rates (proportions) of students with a GPA in the 2.00 to 2.90 range (P=.60) and students with a GPA > 2.89 (P=.83) was .23.

Sport Involvement, Local Residence, Personality and High School Type: Separate Results

Relationships of the sport involvement, local residence, personality, and high school type variables with the predicted GPA, attained GPA, and graduation status variables are shown in Table 2. The academic major variable was considered separately because of its relevance to Tinto's (1975) notion of academic success being relative to characteristics of other students--"peer groups."

Insert Table 2 about here

Groupings of data were used in Table 2 to depict relationships of the high school type and personality variables with attained GPA and graduation status. Five groupings were used for the high school type variable. The five groupings were based on discernible relationships of the high school type variable with attained GPA and graduation status. Three groupings were used for the personality variables. The basis for the personality groupings was a weighted sum (composite) of values obtained from the personality measures that, independent of predicted GPA values, correlated with attained GPA. For comparison purposes, these three groupings of personality variables were formed so that percentages of students in the groupings were the same as percentages of students whose attained GPA values were: (a) < 2.00, 24%; (b) > 2.89, 30%; and (c) ranged from 2.00 to 2.89, 46%. Respectively, the three groupings reflect percentile ranks (PR) from 1 to 24, 25 to 69, and 70 to 99. The personality measures having the highest correlations with the composite personality variable and the type of relationship for these measures were: (a) positive for academic skill and organizing work self-ratings; (b) positive for the SBI motivation, study effort, and time management scales and negative for the academic skill concern scale; and (c) relationships indicating higher GPA values (relative to predicted GPA) for MBTI sensing types than for intuitive types and for judging types than for perceiving types.

Percentile ranks (PR) of predicted GPA means (relative to the overall distribution of predicted GPA values) are used in Table 2 to depict relationships of the academic preparation variable with other variables. Percentile ranks of predicted GPA means for student groups identified by the sport involvement, local residence, and personality variables were essentially equivalent. In contrast, there were differences in the percentile ranks of groups identified by the high school type variable. Differences in student predicted GPA means, attained GPA means, and graduation rates provided the rationale for forming the groupings shown for the high school type variable.

Sport involvement and local residence. The attained GPA means and graduation rates for the sport involvement and local residence variables ostensibly supported Tinto's (1975) notion that social integration can be a factor in student attrition: (a) the attained GPA means and graduation rates were higher for both athletes and spectators than for other students, and (b) the attained GPA mean and graduation rate were higher for students who had lived in residence halls than for other students. The combination of these two variables yielded a substantial difference in graduation rates for students whose GPA met the 2.00 GPA requirement. The graduation rate for athletes and spectators combined (athletes/spectators) who had lived in residence halls was .82; whereas, the rate was .55 for students who were neither athletes nor spectators and had not lived in residence halls. This difference of .27 in graduation rates was evaluated as

substantial in light of the essentially equivalent group predicted GPA means (PR=56 and PR=58; not reported in Table 2) and the fact that the difference was approximately of the same magnitude as the difference in graduation rates (Pdiff=.23) of students with an attained GPA of or less than 2.89 and students with an attained GPA greater than 2.89. Moreover, graduation rates were higher for the athlete/spectator and residence hall groups for all subgroups identified by other variables; that is, social "involvement" seems to be important for retention of students with varied backgrounds, personalities, vocational interests, and so on. Generally, results for the sport involvement variable indicated that, proportionately, the BSU sports program served members of the 1983 freshman class who would graduate.

Personality Measures. The difference between attained GPA means of students indicating the most (PR > 69) and least favorable (PR < 25) combination of personality attributes (Mdiff=.45) exceeded all differences in attained GPA means for the sport involvement and residence hall variables. The difference in overall graduation rates for these two groups was about of the same magnitude as the overall differences observed for the sport involvement and local residence variables. However, for students who met the 2.00 GPA criterion, the difference in graduation rates of the two groups was appreciably smaller than differences identified for combinations of the sport involvement and local residence variables. Thus, the personality composite explained some variability in attrition rate through its relationship with attained GPA, but, comparatively, it appeared to be less of an

explanatory factor than social integration when evaluating the attrition of those students able to avoid academic disqualification. Because the personality data were obtained before students matriculated, such data might be useful for identifying (in addition to traditional admission data) some matriculates likely to experience academic difficulty.

High School Type. The most meaningful difference for the high school type variable involved students from HSTYPE 2 and HSTYPE 3 schools; respectively, city schools where less than 70% of graduates go to college, and private and public schools where more than 69% of the graduates attend college. Students from HSTYPE 2 schools had an average predicted GPA mean (PR=52), but a relatively low attained GPA mean (M=2.21) and graduation rate, both overall (P=.40) and for only those students who met the 2.00 GPA requirement (P=.61). Students from HSTYPE 3 schools had a relatively low predicted GPA mean (PR=30), but an average GPA mean (M=2.43) and graduation rate, both overall (P=.55) and for only those students who met the 2.00 GPA requirement (P=.71). While "quality" of education might explain the difference in GPA of students from two types of schools, it does not explain the differential graduation rates for students who met the 2.00 GPA criterion. The latter might suggest differences in the general academic orientation for student backgrounds. Irrespective of an explanation, type of high school attended could be indicative of the eventual academic success of some students. Such information is available before students matriculate and, like the personality data, might be used to supplement other information in identifying "high-risk" freshmen. For the

other high school groupings, students from HSTYPE 1 and out-of-state high schools had both the highest predicted and attained GPA means. The distinction between these two groups was the high graduation rate for students from HSTYPE 1 schools and the low rate for students from out-of-state schools.

Sport Involvement, Local Residence, Personality, and High School Type: Combined Results

Relationships of the combined sport involvement, local residence, personality, and high school type variables with GPA and graduation status are shown in Table 3 for three groupings of predicted GPA values. The index used for combining the variables was the net number (sum) of "positive" and "negative" attributes indicated by categories shown in Table 2. Positive attributes (+1) were for athlete/spectator students who lived in a residence hall, had a personality PR > 69, and graduated from a HSTYPE 3 school; negative attributes (-1) were for students who were neither athletes nor spectators, lived other than in a residence hall, had a personality PR < 25, and graduated from a HSTYPE 2 school; and other categories were neutral (0). The groupings used for the predicted GPA values reflected PR rank ranges of < 25, 25 to 69, and > 69.

Insert Table 3 about here

The principal point illustrated in Table 3 is the cumulative relationship of the "small" to "moderate" effects of the variables with graduation status. The overall difference between graduation rates of students identified by extremes of the index (-2 and fewer vs. 2 and more attributes) for different levels of predicted GPA values were .36, .39, and .40; for students meeting the 2.00 GPA criterion, tne differences were .22, .28, and .33. By comparison, the difference in overall graduation rates for students with a predicted GPA PR < 25 and students with a predicted GPA PR > 69 was .32; for students meeting the 2.00 GPA criterion, the difference was only .06. In short, while the consensus is that predicted college achievement and attrition based on such traditional predictors as SAT scores and high school achievement is the most justifiable basis for admitting students, several other variables, most having only "small" effects, together have an important cumulative effect on attrition. Some of these might be used for identifying students who most need special attention and/or suggesting strategies for reducing attrition.

Academic Major

The predicted GPA means, attained GPA means, and graduation rates of students grouped according to enrollment within nine groupings of departments are shown in Table 4. Criteria for identifying the departmental groupings were the academic preparation of graduates from departments and the graduation rates of students enrolled in these departments who met the 2.00 GPA requirement. Most of the departments

identified with the groupings are noted at the bottom of Table 4.

Insert Table 4 about here

Considerable variation can be noted in the predicted GPA means of graduates from the departmental groupings. Predicted GPA means of graduates were lowest for ACAMAJ 1, 2, and 3 departments (although about the same as the average 1983 BSU freshman), somewhat above average for ACAMAJ 4 and 5 departments, and highest for ACAMAJ 6, 7, and 8 departments. The distinction between graduates who were enrolled in the same department during their first term as when they graduated (identified as "no change") and graduates who were "undecided" or enrolled in a different department during their first term (identified as "changed to") shows that only small differences existed in the academic preparation of graduates enrolled in the same department throughout college and graduates who changed to a particular department (or, who were initially "undecided"). Predicted GPA means for dropouts from various departments were generally in the same relative order of magnitude as predicted GPA means for graduates from the departments.

Together, the variability in predicted GPA means for graduates from various department groups and the similarity in order of predicted GPA means for departmental graduates and dropouts seemed to support Tinto's (1975) notion about "peer groups" influencing the academic success of some students. Specifically, predicted GPA means of dropouts from ACAMAJ 6, 7, and 8 departments were: (a) clearly higher than predicted GPA means of other dropouts, (b) about the same magnitude as the average 1983 freshman, and (c) slightly higher than graduates from ACAMAJ 1, 2, and 3 departments. In contrast, for ACAMAJ 6, 7, and 8 dropouts: (a) predicted GPA means were about one-half standard deviation units below the means for ACAMAJ 6, 7, and 8 graduates, (b) only about one-half of the dropouts met the 2.00 GPA requirement; and (c) of course, all did not graduate. In short, some of these dropouts might have been academically successful if enrolled in a different major, that is, associated with a "peer group" with academic preparation more commensurate with their own. The fact that other students with a similar academic preparation were academically successful when enrolled in other departments (e.g., ACAMAJ 1 and 2), either initially or after having changed to a department, provides indirect support for this conjecture.

Many institutions use predicted GPA values to identify matriculates who are "at-risk" of having academic difficulty and to assign such students to special programs. An implication of findings for the departmental grouping variable is that being "at-risk" might be relative to an academic

major, that is, an "average" matriculate with regard to academic preparation can be "at-risk" if enrolling in particular departments. Data about characteristics of students able to achieve acceptable grades and graduate from different departments might be useful in assisting students to choose a major.

For students whose GPA met the 2.00 requirement, graduation rates ranged from .57 for students enrolled in 2-year programs (ACAMAJ 3) to .82 for accounting majors (ACAMAJ 7). Except for students enrolled in 2-year programs, the principal source for the variation in graduation rates was the difference in rates of students attaining lower GPA values: graduation rates ranged from .41 to .77 for students attaining a GPA in the 2.00 to 2.89 range, whereas, there was only small variation in graduation rates of students attaining a GPA in 2.90 to 4.00 range. A post hoc comparison of graduation rates of students with different GPA levels for the 20 initial departmental groupings (i.e., GPA by departmental group interaction) yielded an ES value of .16, an ES as large as the ES for the grouping variable itself. The combined ES value for this interaction and the departmental grouping variable itself (main effect) was .25.

It is important to note that the difference in graduation rates of lower achieving students was unrelated to the academic preparation of students enrolled in the departments. Predicted GPA means of graduates from ACAMAJ 7 and ACAMAJ 8 departments were essentially equivalent, but graduation rates of students with lower GPA values were .41 and .77. Similar

differences can be observed for ACAMAJ 1 and ACAMAJ 2 departments and for ACAMAJ 4 and ACAMAJ 5 departments.

The distinction between university and departmental GPA requirements might explain some of the differences in graduation rates of lower achieving students. For many academic administrative units (colleges, departments, and majors offered in departments) at BSU, students may identify with a unit, take courses required by a unit, and meet the university 2.00 GPA requirement; however, because of low GPAs, they may not be "formally admitted" to or they may be disqualified from pursuing a particular field of study. For example, the ACAMAJ 5, 6, and 8 groupings were comprised of fields of study that had some distinctive form of departmental requirements: teaching majors (in ACAMAJ 5 and 8 departments) had to meet GPA requirements (although specific requirements varied for different fields); there was a high demand for computer science and nursing majors (in ACAMAJ 8 departments), so these departments had previously implemented a GPA requirement; and architecture and the art department (in ACAMAJ 6 departments) had attained GPA and performance requirements.

Differences in graduation rates for departments and for students attaining different levels of GPA have several implications. First, use of a variable representing different fields of study can be useful for studying attrition, identifying academic units that might be particularly problematic with regard to attrition (instead of just a "university-wide" concern), and perhaps, initiating more

specific programs for reducing attrition. Second, if differences in university and departmental requirements exist, the "academic disqualification" and "voluntary withdrawal" concepts used in attrition studies might be considered in terms of particular academic units instead of being universally applied to an institution. Third, departmental requirements that differ from university requirements can counter university-wide efforts to attract and retain students, particularly in instances when it is relatively difficult for students to change majors. Students may be attracted to an institution because of interest in certain fields of study and be able to meet institutional academic requirements, yet be unable to meet departmental requirements and unable to identify another interesting field of study or spend the additional time required for studying another field. In some fields, more selective criteria may be necessary because of external certification requirements. In other instances, more stringent criteria may merely result from the number of students interested in the field: when the pool of students interested in a particular field of study becomes large, the criteria for admission tend to become more stringent.

Conclusions

The present study identified, as Tinto's (1975) model proposes, background variables other than high school achievement and standardized test scores that might predict college achievement, and college experience variables other than college achievement that seem to affect attrition. While

individual, partial relationships of these variables with GPA and attrition were in the "small" range, the cumulative effects of these variables were substantial in comparison to partial relationships for predicted and attained GPA. However, with all variables considered, there still remained a large percentage of unexplained variance in the attained GPA and graduation status variables.

The large unexplained variance in student GPA and attrition does not detract from Tinto's (1975) model. Tinto (1982) stated that the model was developed to account for only some of the factors that influence attrition--not span the domain of all such factors. Moreover, some concepts in the model were probably not operationally defined as well as other concepts; for example, the social integration concept was underrepresented considering the many ways that social integration could occur. In addition, no information was used regarding student evaluation of the academic environment and student contact with university personnel. During the time span of this study, information available in the university database was more abundant for such variables as gender, race, aptitude tests, high school achievement, and college grades than for other types of variables. And, when the other type of data could be obtained, they were "current" (e.g., local residence and academic major), only collected before students entered college (e.g., the MBTI and SBI data), and collected for only one group of matriculates. The most productive attrition research includes the systematic collection of a variety of the same type of data at different points in time

for more than one group of matriculates, where a second group can serve as a validation sample for a first group. This requires a substantial commitment on the part of an institution.

The tradition of behavioral research is to identify variables having "large" effects, usually involving a large percentage of individuals. On the other hand, behavioral theory points to the uniqueness of persons, situations, and the interface between the two--points emphasized by Tinto (1982). Results reported herein suggest the absence of one or just a few variables (other than attained GPA) that will help in explaining or predicting the attrition of a large number of students. Specifically, relationships of individual variables with attrition were small with respect to the number of students involved, but the number of students involved when combinations of variables were considered was substantial. In addition, it is very likely that interactions among variables exist with regard to achievement and attrition; for example, the GPA by departmental enrollment interaction identified in this study, an interaction between personality and departmental enrollment (Schurr, et al., in press), and an interaction between academic preparation and difficulty of class schedule (Henriksen, et al., 1988). Ignoring variables having "small" relationships with GPA and attrition simply because the relationships are small may be a mistake (assuming they are cross-validated). These variables might be important for explaining the college success of <u>some</u> students. Generally, the most productive program to reduce attrition may

be one that maintains an ongoing relationship with students, monitoring their progress and working with their particular set of circumstances. Such a program would be very expensive and need support from, and for, both academic and student affairs type administrative units.

Finally, Pantages and Creedon (1978) recommend a longitudinal design spanning more than four years for studying attrition. However, generalizability limitations for results from such research might exist, even when a validation sample is used and the potential for generalization is to the same institution where the research was conducted. Changes in attributes of matriculates and in an institution could affect the applicability of results of a study beginning five years earlier. At BSU, for example, there have been changes in the duration of academic terms from quarters to semesters, admission standards, general studies requirements, and demands and requirements for different fields of study. Nevertheless, we hypothesize that relationships for concepts reported herein are applicable to new BSU matriculates (which have been substantiated for some variables), even if specific values and groupings used as indicators for the concepts may have changed. The hypothesis raises the question, will an institution make a commitment to replicated longitudinal attrition research that periodically collects "non-archival" type data rather than one-shot studies that collect such data only one time? Furthermore, will an institution commit to intervention programs suggested by replicated results when only a small number of students might be affected?

Using computers for data collection, BSU has initiated an extensive questionnaire survey that freshmen complete during their first semester. The data are available for advising purposes as well as providing the start for a longitudinal database. Also, there have been several changes in the advising and other services provided for students by the university that are consistent with the spirit of this report (and interim reports). The nature of the database, use of the data, existence of new retention programs based on the data, and attrition rate five years from now will be of interest.

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Table 1

Partial Effect Size Values for Individual and Combined Predictor Variables of Attained GPA and Graduation Status

Source	Criterion Variable					
	Attained GPA (n=3125)			Graduation (n=2860)		
	DF	ES	Sig	DF	ES	Sig
Academic Preparation	3	45	.001	3	10	.001
Other Variables Combined	66	47	.001	64	32	.001
Combined Background and Personality Variables	41	36	.001	41	21	.001
Combined Academic and Social Variables	25	31	.001	23	24	.001
Attained GPA				2	36	.001
			Background			
Gender	1	01	.739	1	07	.001
Hometown	1	01	.531	1	04	.024
High School Type	13	18	.001	13	16	.001
Race	1	08	.001	1	01	.497
Combined	16	21	.001	16	17	.001
			Personality			
Self-Ratings	14	19	.001	14	09	.051
Study Concerns	8	18	.001	8	06	.203
MBTI	3	12	.001	3	05	.107
Combined	25	30	.001	25	11	.034
			Academic			
Academic Major	21	23	.001	19	19	.001
Early Schedule Difficulty	1	09	.001	1	03	.174
Combined	22	25	.001	20	19	.001
			Social			
Local Residence	1	14	.001	1	10	.001
Sport Involvement	2	08	.001	2	11	.001
Combined	3	17	.001	3	16	.001

Note. Values for significance tests < .001 are denoted as .001. ES values have been multiplied by 100.

Table 2

Attained and Predicted GPA Means and Graduation Rates for Sport Involvement, Local Residence, Personality, and High School Categories

Group	n	Predicted GPA Mean PR	GPA Mean	Graduation Rate (P)	Graduation Rate for Students Attaining a GPA > 1.99					
					Combined		Athletes/ Spectators		Other	
					n	P	n	P	n	P
Sport Involvement										
Athlete	88	50	2.68	.63	77	.71				
Spectator	562	48	2.55	.66	440	.82				
Other	2475	50	2.46	.49	1793	.65				
Local Residence										
Hall	2449	51	2.55	.57	1885	.72	475	.82	1410	.69
Other	679	46	2.23	.38	425	.58	42	.80	383	.55
Personality PR Grouping										
PR < 25	751	52	2.26	.42	483	.64	106	.78	377	.60
PR 25-69	1440	49	2.45	.52	1046	.69	246	.81	800	.66
PR > 69	934	50	2.71	.63	781	.73	165	.83	616	.71
High School Grouping										
HSTYPE 1	104	64	2.59	.62	80	.78	23	.87	57	.75
HSTYPE 2	321	52	2.21	.40	199	.61	46	.85	153	.56
HSTYPE 3	395	30	2.43	.55	301	.71	64	.86	237	.66
Out-of-State	106	58	2.71	.46	88	.54	23	.61	65	.52
Other	2199	52	2.51	.54	1642	.71	361	.80	1281	.68

Note. HSTYPE 1, non-city schools with % of graduates attending college < 30; HSTYPE 2, city schools with % of graduates attending college < 70; HSTYPE 3, private schools and public schools with % of graduates attending college > 69.

Table 3

Predicted GPA Mean PR, Attained GPA Mean, and Graduation Rate for Predicted GPA Groupings and Combined Sport Involvement, Local Residence, Personality, and High School Categories

Number of Positive Attributes	All Students				Students with a GPA > 1.99		
	n	Predicted Mean PR	GPA Mean	Graduation P	n	% of All Students	Graduation P
			Predicted GPA PR < 25				
-2 and fewer	107	10	1.50	.17	31	30	.55
-1	128	10	1.79	.25	52	42	.60
0	202	10	2.01	.36	105	54	.65
1	185	10	2.16	.39	109	60	.66
2 and more	135	09	2.23	.53	91	69	.77
Subgroup	757	10	1.97	.35	388	53	.67
			24 > Predicted GPA PR < 70				
-2 and fewer	238	46	2.05	.30	132	58	.52
-1	256	46	2.24	.41	170	69	.60
0	366	47	2.44	.51	278	78	.65
1	328	46	2.59	.64	275	86	.74
2 and more	239	46	2.63	.69	204	87	.80
Subgroup	1427	46	2.41	.52	1059	76	.68
			Predicted GPA PR > 69				
-2 and fewer	138	87	2.61	.42	108	84	.51
-1	200	89	2.99	.67	180	93	.72
0	242	88	3.05	.71	230	96	.74
1	224	90	3.18	.75	214	97	.78
2 and more	137	88	3.11	.82	131	98	.84
Subgroup	941	89	3.01	.67	863	94	.73

Note. The -2 grouping includes -2, -3, and -4 attributes. The 2 grouping includes 2, 3, and 4 attributes.

Table 4

Percentile Ranks, Attained GPA Mean, and Graduation Rates for Groupings of Academic Majors

Group	Mean					Graduation P for GPA Ranges		
	Predicted GPA PR			Attained GPA		2.00-2.89	2.90-4.00	All
	Graduates		Dropouts	Graduates	Dropouts			
	No Change	Changed To						
ACAMAJ 1	46 n=121	44 n=154	31 n=209	2.79 n=275	1.87 n=209	.71 n=255	.86 n=108	.76 n=363
ACAMAJ 2	46 n=64	47 n=103	34 n=168	2.87 n=167	1.97 n=168	.58 n=163	.85 n=85	.67 n=248
ACAMAJ 3	43 n=21	47 n=95	39 n=164	2.70 n=116	2.10 n=164	.55 n=154	.62 n=50	.57 n=204
ACAMAJ 4	64 n=65	58 n=262	35 n=213	2.86 n=327	2.00 n=213	.71 n=266	.84 n=151	.76 n=417
ACAMAJ 5	60 n=112	64 n=41	37 n=92	3.16 n=153	2.01 n=92	.52 n=76	.90 n=124	.77 n=200
ACAMAJ 6	76 n=137	69 n=60	50 n=140	3.02 n=197	2.13 n=140	.55 n=140	.83 n=144	.69 n=284
ACAMAJ 7	69 n=118	70 n=60	54 n=85	2.88 n=178	2.02 n=85	.77 n=121	.89 n=96	.82 n=217
ACAMAJ 8	75 n=127	74 n=69	53 n=186	3.14 n=196	2.10 n=186	.41 n=136	.86 n=162	.66 n=298
Other			33 n=174		1.83 n=174			

Note. MAJ 1--Radio-TV, Journalism, Home Economics, Industrial Technology, and Applied Teaching (Home Ec, Industrial Ed, and Physical Ed); MAJ 2--Social Sciences and Public Affairs/Service; MAJ 3--2-Year; MAJ 4--Business other than Accounting, Health and Exercise Science; MAJ 5--Elementary/Special Education; MAJ 6--Architecture, Arts, Life Sciences; MAJ 7--Accounting; MAJ 8--Mathematics, Physical Science, Computer Science, Nursing, Secondary Teaching other than Applied areas; Other--Undecided, other Business